



<https://www.nasa.gov/solve/marsbalancechallenge>

MARS Balance MASS Challenge

James E. Johnson
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Best Practices and Lessons Learned





Image obtained from: <https://www.flickr.com/photos/travelcedric/255748676/>
Open Innovation Summit
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james.e.johnson@nasa.gov

Mars Balance Mass InnoCentive Challenge

Goal: *To solicit innovative concepts for using Mars Science Laboratory heritage Balance Mass for achieving science and/or technological objectives*

- **300 kg of Balance Masses flown on MSL to assist spacecraft orientation**
 - Two 75kg Cruise Balance Masses
 - Six 25kg Entry Balance Masses
- **Masses made of solid tungsten**
- **Sought detailed design concepts to replace/integrate with one or more Balance Mass Devices (BMDs)**
- **Supported through NASA's Center of Excellence for Collaborative Innovation (COECI)**
- **Challenge run via InnoCentive**
- **\$20,000 initial prize purse**





Collaborative Innovation = Significant Participation!



2108

Registered Solvers

219

Submissions

95

Participating Countries



Region	Sum of Project Rooms	Sum of Solutions
Africa/Mid-East	65	6
Asia Pacific	103	18
E. Europe/Russia	148	16
North America	1001	104
South Asia	452	43
South/Central America	52	6
W. Europe & Nordic	287	31
Grand Total	2108	224



Our Evaluation Process

- Culling of submissions yielded 93 submissions worthy of detailed review
 - ~40% of total submissions
- Assembled 16 person Agency-wide review team
 - 4 week review period
- Submission review utilized an Excel rubric with Likert scale evaluation of:
 - Judging Criteria
 - Project Criteria
 - Technical Requirements
- “Top 10” identified by submission ranking in relation to each of the evaluation area as well as an average rating

Challenge Number	Short Description	Score	Project Criteria																		Technical Requirements																		Miscellaneous		
			Creativity	Practicality	Knowledgeable	Relevance	Sig Tech	Alt Org Concept	Alt Propulsion	Alt Power Source	Alt Data Path	Alt Primary Prototype	Alt Prototype Plan	Alt Solution Details	Engineering	Alt Info/Res	Alt Mach	Alt Traj	Alt Altitude	Alt F/T Gnd	Alt Enviro	Alt End-User	Alt Payload	Alt Prod. Langaging	Alt Low Res. Concrnt Res.	Alt Payload Chng	Alt Data Plan	Alt Data Rthm & Cntrll	Alt No Hazard	Section for miscellaneous details (does not print).											
001	Multi-Balloon Canister	5	3	2	3	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	N/A	No	No	No	No	No	No	No	No	No	No	No	No	Too little detail. Interesting concept, but just not developed sufficiently.						
002	Drones	5	2	1	3	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	No	N/A	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	Interest concept although drone use is not novel. Good dimensioning, but no mass allocation.							
003	Astronaut Tools	5	2	1	1	No	No	Yes	No	N/A	N/A	No	No	No	Yes	No	No	No	No	No	N/A	Yes	No	Yes	No	N/A	No	No	No	No	No	No	No	Very creative idea, but not developed sufficiently. Major risk for crew retrieval at a minimal gain.							
004	Mars Radio	4	1	1	1	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes							
005	Current Generation - N/A	5	1	1	1	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Too little detail. Does not advance state of scientific knowledge or technology.							
006		5																																				No mention of applicability to balance mass. A unrelated research paper.			
007		5																																							
008		5																																							
009		5																																							
010		5																																							
011		5																																							
012		5																																							
013		5																																							
014		5																																							
015		5																																							
016		5																																							
Creativity Is the concept novel and not repetitive? (1=Not novel/Highly Repetitive, 5=Very Novel/Non-Repetitive)																																									



MARS Balance MASS Challenge

Winner was Ted
Ground from
Rising Star, Texas
(population 799)

Honorable
Mention team
from Grand
Rapids, Michigan

\$25,000 in prizes awarded!

Winning Submission: Barium tracers for atmospheric analysis

Honorable Mention: Micro-balloon deployment for wind analysis



Lessons Learned in Open Innovation



1. Have a challenge owner
 - Who ‘owns’ the problem?
 - Implementing a solution needs a champion
2. Establish your evaluation criteria before you start
 - Ask “what would a winning submission look like?”
3. Leverage promotion opportunities
 - Identify critical times & opportunities for promoting a challenge
 - Help solvers to fully understand your problem
4. Collect a diverse review team
 - Diverse teams can see unlikely intersections
 - Avoid last minute searches for ‘experts’
5. Give ample time for the review process
 - Avoid holidays!
 - Ensure commitment from your reviewers
6. Make a decision!
 - Quantitative assessment is a tool, but won’t decide for you
 - A small team may be needed for a final selection
7. Have an open innovation strategy
 - Consider future challenges opportunities early